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How did musicians know what were the notes frequencies if they had no measuring tools? [duplicate]

Asked 4 years ago Modified 4 years ago Viewed 785 times



2



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[History of standardization of pitch and tuning: measuring waves](#) (2 answers)

[Absolute pitch - has it varied through the centuries?](#) (4 answers)

Closed 4 years ago.

Today we have devices that with the aid of a microphone can detect the frequency of a note. We can therefore calibrate all instruments and voices to a same pattern. But, how did people know how the notes sounded when there was no reference provided by a measuring tool? Was it just transferred from generation to generation by oral tradition? In such case, does that mean that music might sound slightly different if played by two different countries, for example? Maybe there existed a pattern like the rod in Paris that was the reference for the unit meter? Was there any rule like "A" is the note played when you hit a string made of this material and tensed to that force?

[instruments](#) [sound](#) [frequency](#)

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edited Nov 1, 2019 at 11:41

asked Nov 1, 2019 at 9:32



Claudi

169 1 6

1 en.wikipedia.org/wiki/Tuning_fork – piiperi Reinstate Monica Nov 1, 2019 at 10:26


@piiperi but this was on the XVIII century. What about before? – [Claudi](#) Nov 1, 2019 at 11:40

@piiperi, the wiki post doesn't really answer the question. Pre 1700's what did people do? If anything.
– user50691 Nov 1, 2019 at 17:54

@CarlWitthoft, this does not appear to be a dup of the question in the link. They are asking different things. – user50691 Nov 1, 2019 at 17:55

@Claudix, you may want to ask this in the physics stack exchange. This seems to be about the technique of measuring pitch and that falls under science. It may be that they didn't measure A to be 438, or 440. They may have tuned an instrument and set one pitch as a standard, then tuned relative to that. – user50691 Nov 1, 2019 at 17:57

1 Answer

Sorted by: Highest score (default) 



5



No one measured the exact frequency of a vibrating object until Marin Mersenne in the 1600s, and his measurements were only rough estimates. Mersenne ultimately developed a series of observations that could relate frequency to various physical characteristics of strings (which was extended to other objects eventually). So, it was Mersenne who first hinted at the OP's idea at the end of the question that one could use a certain tension, string diameter, etc. to get a certain frequency. But it then took a couple centuries after Mersenne to develop equipment which could actually measure sound frequencies accurately.

So what did musicians do before the development of such measurement devices? They didn't really care about frequency, per se. They cared about tuning to whatever standard was around them. Large ensembles like our modern orchestras didn't really exist in ancient times, and small groups of musicians often had instruments with more variable tuning (e.g., string instruments, where tension could be adjusted) that could be put in line with those instruments that were more fixed and less adjustable (e.g., some wind instruments, whose pitch was somewhat fixed by their size). Those fixed size instruments, like certain wind instruments and organ pipes, are often clues to the historical pitch and intonation, and they could be standards of pitch continuity. In effect, the first "measuring tools" for pitch were fixed-pitch musical instruments.

In medieval times and up to the 1700s, the local standard that instruments often tuned to was the local church organ, which was probably the most difficult instrument in town to change tuning. Historical organs varied greatly in their tuning, with the A above middle C (now thought of as "A440") tuned anywhere in a very broad range. Alexander Ellis, who translated Hermann Helmholtz's *On the Sensations of Tone* (a treatise from the beginning of when scientists finally started measuring pitch accurately in the 1800s), did a survey of European organs and found that the A frequency varied as much as from about 370 Hz to 570 Hz (which is a difference of more than a perfect fifth).

But as professional musicians started to travel more from town to town and eventually from country to country, standards developed among instrument makers that narrowed the range

of possible pitch further. Still, in the 1600s a musician moving to a new town might sometimes need to acquire new instruments built to local pitch standards (particularly for wind instruments). And towns with organs far off of emerging regional standards often had to write transposed parts for organists playing along with the musicians.

With the scientific measurement of frequency following Mersenne, it also became possible to create new standards based on physical objects which were then known to vibrate at a specific frequency. Tuning forks were invented in the early 1700s and emerged as one way to compare pitch standards between different places. This led to multiple scientific attempts to promote a standardized pitch scale, which eventually settled on A440 in the 1800s, around the time that it finally became possible to measure frequencies in that range accurately and more directly.

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edited Nov 3, 2019 at 0:46

answered Nov 2, 2019 at 6:15



Athanasius

12.4k 22 50

"the local standard that instruments often tuned to was the local church organ": only if they were playing in church, and sometimes they tuned their A to the organ's G. There's an interesting discussion in the Wikipedia article on [concert pitch](#). Look for *Kammerton* and *Chorton* (chamber pitch and choir pitch). – phoog Nov 2, 2019 at 16:02

Could you link to a source describing the Helmholtz pitch survey? – phoog Nov 2, 2019 at 16:08

@phoog - note what I said later: "And towns with organs far off of emerging regional standards often had to write *transposed parts* for organists playing along with the musicians." I know about Kammerton vs. Chorton; hence my reference to it. And apologies - the pitch survey was apparently conducted by Ellis, the translator of Helmholtz's *On the Sensations of Tone* into English. It can be found in Appendix H of the English edition, translated by Ellis. I will correct my answer. – Athanasius Nov 3, 2019 at 0:43 ✎

So Bach's music sounded different in his times compared to our times? When were the rules of distance between notes born? – Claudi Nov 5, 2019 at 19:18

- 1 @Claudix: I'm guessing by "distance between notes" you're referring to relative pitch, like how you tune the different notes of the scale. You don't need to know anything about frequencies to do that. In ancient Greece, they discovered that strings that are double the length are an octave lower. Strings that are in a 3:2 length ratio create a perfect fifth; 4:3 ratio a perfect fourth, etc. Pipes work similarly. You can build instruments and tune scales this way. Bach's music was likely played at a lower pitch overall, but the general scale notes had a somewhat similar relationship to today. – Athanasius Nov 6, 2019 at 22:42